

Serial Numbers for the co-pending related applications cross-referenced at page 1, lines 2-8 of Serial No. 12,205. Since this application is a FWC of Serial No. 12,205, the previously made Government Support Statement and Serial Number identification amendments made in Serial No. 12,205 are already a part of this FWC application, hence need not be repeated by this Preliminary Amendment.

Applicant's counsel would first like to extend to Examiner Albrecht his appreciation for the courtesies shown and helpful discussion which occurred during the interview conducted on January 6, 1989 in parent application Serial No. 12,205. The interview with Examiner Albrecht was attended by Charles M. Cox, James B. Gambrell and, at the request and permission of Applicant, Gerald E. Deitch, Counsel for DuPont.

During the interview claims 13-16, earlier presented in Serial No. 12,205 by a Supplemental Amendment mailed October 18, 1988, and claims 17-24 proposed for addition to application Serial No. 12,205, were discussed. At the time of interview, Examiner Albrecht was provided with copies of each of the following articles:

- (1) K. G. Frase et al, "Phase Compatibilities in the System  $Y_2O_3$ -BaO-CuO", Advanced Ceramic Materials, Vol. 2, No. 3B, Special Issue, 1987, pp. 295-302.
- (2) R. S. Roth et al, "Phase Equilibria and Crystal Chemistry in the System Ba-Y-Cu-O", Advanced Ceramic Materials, Vol. 2, No. 3B, Special Issue, 1987, pp. 303-312.

- (3) G. Wang et al, "950°C Subsolidus Phase Diagram For  $Y_2O_3$ -BaO-CuO Systems in Air", Advance Ceramic Materials, Vol. 2, No. 3B, Special Issue, 1987, pp. 313-326.
- (4) D. W. Murphy et al, "Processing Techniques for the 93K Superconductor  $Ba_2YCu_3O_7$ ", Science, Vol. 241, pp. 922-930 (August 19, 1988).

The Y-Ba-Cu-O system phase diagram information set forth in such articles was briefly discussed in connection with claims 13-16 as pending and claims 17-24 as proposed.

Upon conclusion of the interview Examiner Albrecht indicated that, in view of the November 1, 1988 Office Action final rejection of claims 9-12 which did not act on claims 13-16 previously submitted, he was disinclined to enter proposed claims 17-24 in parent application Serial No. 12,205 but would soon issue a Supplemental Office Action on claims 13-16 since such claims had been submitted prior to the issuance of the Office Action of November 1, 1988. For purposes of having all claims considered together, that is, claims 13-16 as pending and claims 17-24 as proposed, Applicant indicated a desire to file a File Wrapper Continuing (FWC) application. Examiner Albrecht thereupon indicated he would withhold action on claims 13-16 in Serial No. 12,205 for a two week period to provide Applicant an opportunity to file a FWC application which would present claim 13-24 by a Preliminary Amendment filed with the FWC application.

This Preliminary Amendment cancels without prejudice claims 9-16 as pending in parent Serial No. 12,205 and adds claims 17-21 to this FWC application. Subsequent to

the interview it was decided that to simplify consideration of the claims to be presented in this FWC application, the number of claims presented would be reduced. Accordingly, of claims 9-16 pending and claims 17-24 proposed for Serial No. 12,205, some of such claims have been cancelled and others reorganized and consolidated to form new claims 17-21 hereby presented.

The claims hereby presented related to the claims discussed during the interview are as follows: presented claim 17 is a consolidation of claims 16 and 18-20 as discussed during the interview; claim 18 presented is a consolidation of claims 17-20 as discussed during the interview; claim 19 presented is a consolidation of claims 18-20 as discussed during the interview; claim 20 presented is a method of use claim corresponding to the composition defined in presented claim 17; and presented claim 21 is a method of use claim corresponding to the composition defined in presented claim 18.

#### Claims 17-19

In connection with present claims 17-19, the Examiner's attention is again directed to the articles by Frase et al, Roth et al, Wang et al, and Murphy et al relating to the phase equilibria for a Y-Ba-Cu ternary oxide system. Such articles clearly establish that: (1) the only previously known ternary oxide of Y-Ba-Cu was  $Y_2Ba_1Cu_1O_z$  (hereafter referred to as "211") which is an electrical insulator having no superconductive properties; (2) that  $Y_1Ba_2Cu_3O_z$  (hereafter referred to as "123") is the only ternary oxide of Y-Ba-Cu which has the properties

of superconductivity; and (3) since the discovery of a Y-Ba-Cu-O oxide material having a  $T_c$  of  $>90^\circ\text{K}$  one further ternary oxide of Y-Ba-Cu has been observed, namely  $\text{Y}_1\text{Ba}_3\text{Cu}_2\text{O}_z$  (hereafter referred to as "132") and that "132" has no superconductive properties.

From the above it may clearly be seen that claims 17-19 read upon compositions of matter which inherently contain  $\text{Y}_1\text{Ba}_2\text{Cu}_3\text{O}_z$  in that such claims recite "a superconductive crystalline phase consisting essentially of Y, Ba, Cu and O which has zero electrical resistance at  $77^\circ\text{K}$  or above." Claim 17 recites the composition as one having the nominal composition  $(\text{Y}_{1-x}\text{Ba}_x)_a\text{Cu}_b\text{O}_y$  where "x" is 0.01 to 0.5, "a" is 1 to 2, "b" is 1, and "y" is 2 to about 4. Claim 18 is similar to claim 17 but further recites the composition to comprise a nominal formula of  $\text{Y}_{1.2}\text{Ba}_{0.8}\text{CuO}_y$  by reciting that "a" = 2 and "x" = 0.4, hence claim 18 reads specifically on the Y-Ba-Cu-O complex described in Example XI of the application. Claim 18 recites a Y-Ba-Cu-O complex having at least the minimum superconducting properties as illustrated by the Example XI material.

It is believed that  $\text{Y}_1\text{Ba}_2\text{Cu}_3\text{O}_z$  (123) is without doubt patentable. Applicant submits that a composition which contains  $\text{Y}_1\text{Ba}_2\text{Cu}_3\text{O}_z$  in quantities sufficient to render the composition to have a zero electrical resistance is also patentable.

Claims 17-18 recite such a composition and there can be no doubt that the compositions so recited contain "123" in quantities sufficient to render the compositions to have zero resistance. Claims 17-18 distinguish the

superconductive crystalline phase of Y, Ba, Cu, and O from being in any way analogous to the Bednorz and Muller superconductive complex of La-Ba-Cu-O which has a crystal structure like that of  $K_2NiF_4$ . Claim 17 recites compositions within a bounded region of the Y-Ba-Cu ternary oxide system phase diagram, and claim 18 defines a point within such region where an appropriately prepared Y-Ba-Cu-O material is now known to have a 123 phase content and hence have a zero resistance. With reference to the Y-Ba-Cu-O system phase diagrams, the precise region encompassed by claim 17 and the point defined by claim 18 may readily be determined. See Exhibit A attached hereto. Exhibit A is styled according to the phase diagram presentation of the Roth et al article. The dashed lines in Exhibit A illustrate the region defined by the claim 17 formula  $(Y_{1-x}Ba_x)_aCu_bO_y$  for the values  $a = 1$ ,  $x = 0.01-0.05$  (right hand dashed line) through  $a = 2$ ,  $x = 0.01-0.5$  (left hand dashed line). That portion of the dashed line area above the solid "join line" between  $Y_2Ba_1Cu_1O_{5+x}$  and  $CuO_x$  is the region wherein a Y-Ba-Cu-O composition will result which contains a quantity of 123 and hence be rendered to have zero resistance at 77°K or above.

Claim 18 claims a Y-Ba-Cu-O complex of the nominal formula wherein "a" = 2, and "x" = 0.4, namely a nominal formula of  $Y_{1.2}Ba_{0.8}CuO_y$ , which has zero electrical resistance. The composition so claimed is that described in Example XI of the application. From the Y-Ba-Cu-O phase diagram information provided one can readily determine that the claim 18 composition so claimed (the interception point of the  $a = 2$ ,  $x = 0.4$  lines in

Exhibit A) contains about 71 mole % of "211", about 26.6 mole % "123" and about 2.4 mole %  $\text{CuO}_x$ . The 26.6 mole % "123" shown by the phase diagram for a composition prepared of nominal formula  $\text{Y}_{1.2}\text{Ba}_{0.8}\text{CuO}_y$  (i.e., "a" = 2, "x" = 0.4) relates quite closely to the diamagnetic signal at 4.2°K corresponding to 24% of the superconducting signal of a lead sample with similar dimensions as reported in Example XI as a property of the Y-Ba-Cu-O complex there described.

With reference to claim 19 it should be realized from the phase diagrams that claim 19 reads upon a Y-Ba-Cu-O complex containing a significant amount of "123." Claim 19 limits the composition to one wherein the content of the superconductive phase is sufficient to provide at least 24% of the superconducting signal of a lead sample. This claim thus defines the claimed composition as containing at least about 24 mole % "123". Claim 19 further relates that in the composition, the superconductive phase has a crystalline structure uncharacteristic of  $\text{K}_2\text{NiF}_4$ , the type of crystalline structure which accounts for the 30°K La-Ba-Cu-O superconductor of Bednorz and Muller.

#### Claims 20-21

Claims 20-21 are method of use claims reciting the use of compositions of Y-Ba-Cu-O as set forth in claims 17-18 respectively as a conductor having zero electrical resistance. Claims 20 and 21 are presented on grounds that whether or not the recited Y-Ba-Cu-O compositions are novel (and Applicant believes they are) the discovery that

a Y-Ba-Cu-O composition may be used as zero resistance conductors at 77°K or above is a new use discovery. Hence, the patentability of claims 20-21 is established on grounds that no reference is known which suggests such use for a Y-Ba-Cu-O composition.

Claims 17 to 21 each clearly cover compositions of Y-Ba-Cu-O which contain significant quantities of "123". From the 24% superconducting signal of a lead sample limitation and the Y-Ba-Cu-O phase diagram information it should be readily appreciated that claims 17-21 cover compositions which, as a minimum, contain at least about 24 mole % of a "123" phase, and in claims 17-18 and 20-21 may range up to about 60 mole % 123 when "x" equals 0.5 wherein the  $x = 0.5$  line intersects the "211-123" join line at about the 60 mole % "123" level.

It is respectfully submitted that the claims hereby submitted represent an earnest effort by Applicant to define subject matter which may be clearly recognized to contain significant quantities of 123 (at least 24% of the superconducting signal of a lead sample within similar dimensions) which renders the claimed Y-Ba-Cu-O composition to have zero resistance. Although the presented claims do not recite 123 as an express limitation it is clear from the phase diagram information that the claims cover only those compositions of Y-Ba-Cu-O which contain a 123 phase. It is Applicant's desire to reach a holding of allowable subject matter as quickly as possible. Hence, Applicant has claimed the Y-Ba-Cu-O composition only in those terms for which written support

is clearly present in Example XI and/or other express disclosures of this or its antecedent applications.

It is believed that allowable subject matter is presented by all of claims 17-21 and a prompt indication of allowability is respectfully requested.

Respectfully submitted,



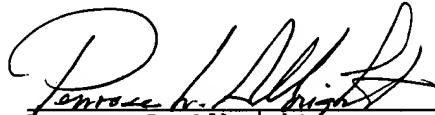
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CERTIFICATE UNDER 37 CFR 1.8(a)

I hereby certify that this correspondence is being hand-deposited with the United States Patents and Trademark on January 23, 1989.



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